TIE PLATE

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of United States Provisional Patent Application Serial No. 60/419,609, filed October 18, 2002, which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to an insulated tie plate for bracing and securing a railroad rail and, more particularly, to a tie plate for electrically isolating parts of a rail system from each other.

Description of Related Art

[0003] A rail system is generally divided into sections or blocks for detecting trains which permit more trains to travel on one stretch of track or railroad rails. Each section is electrically isolated from all other sections so that when no train is present, a high electrical resistance can be measured over the parallel railroad rails in that section. When a train enters the section, the train short circuits adjacent railroad rails and the electrical resistance drops, thus indicating that a train is in that section.

[0004] A tie plate, typically made of metal, is used to secure a railroad rail against lateral, rotational, and vertical movements. See, for example, U.S. Patent No. 6,179,215. Railroad rails are generally joined to each other by welding each end or by attaching the ends using a steel rail joint. Generally, high performance, non-metallic rail joints are used for electrically isolating two railroad rails in order to build an electrically isolated section. However, when two separate railroad rail sections are joined using a typical metal tie plate, electrical isolation of the railroad rail sections will not occur because the current will pass from one railroad rail section through the tie plate and then to the adjacent railroad rail section. Non-metallic insulating tie plates are typically very expensive because of the special high-performance materials needed to endure the high tensile and flexural forces acting on the railroad rail. Also, prior art initially utilized unsupported joints, but due to insulated joints and to high rail traffic, the industry has switch to supported joints. However, the supported joints typically have been made of polyurethane, which cannot take the high rail traffic and fail prematurely.

[0005] It is, therefore, an object of the present invention to provide an insulating tie plate whereby the above drawbacks are eliminated.

SUMMARY OF THE INVENTION

[0006] The present invention provides for an insulating tie plate that includes a base plate having a first surface and defining a peripheral edge. A pair of longitudinally-extending shoulder members are defined on the base plate and can extend a width of the base plate. The pair of longitudinally-extending shoulder members define a recessed area on the first surface of the base plate for accommodating a railroad rail therebetween. A plurality of slots are also defined on the base plate, wherein the slots are adapted to receive fasteners for securing both a railroad rail to the base plate and the base plate to a rail tie. A layer of electrically-insulating material may cover at least a portion of the base plate or encapsulates the base plate. The slots each define an inner surface, wherein the inner surface can be covered by an inner layer made of an electrically-insulating material. The base plate can be a metallic core and the electrically-insulating material can include a polymeric material or a polymeric material containing reinforcing fibers.

[0007] The present invention can also be a tie plate assembly for a railroad rail that includes an electrically-insulated tie plate adapted to receive a railroad rail, a plurality of slots defined on the tie plate, and a fastener passing through one of the slots for securing the tie plate to a rail tie. The electrically-insulated tie plate can be made of an electrically-insulated material or made according to the tie plate as previously described. The tie plate assembly can also include an electrically-insulated clip secured to the tie plate via the fastener, wherein the clip has a surface for coacting with the railroad rail and/or with a rail joint for securing the railroad rail to the tie plate. The surface of the clip can include a first ledge and a second ledge. The first ledge can adapt to coact with the railroad rail for securing the railroad rail to the tie plate. The second ledge can adapt to coact with a rail joint attached to the railroad rail for securing the railroad rail to the tie plate.

[0008] The present invention also provides for an electrically-isolated railroad rail system that includes a pair of railroad rails, a rail joint attaching each of the railroad rails together, an insulated tie plate having a plurality of slots for receiving the attached railroad rails, a fastener passing through one of the slots for securing the tie plate to a rail tie, and an electrically-insulated clip as previously described secured to the tie plate via the fastener, wherein the clip has a surface for coacting with the railroad rail and the rail joint.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 is a side elevational view of a tie plate made in accordance with a first embodiment of the present invention;

[0010] Fig. 2 is a top plan view of the tie plate shown in Fig. 1;

[0011] Fig. 3 is a sectional view taken along lines III-III shown in Fig. 2;

[0012] Fig. 4 is a perspective view, partially in section, of the tie plate shown in Fig. 1;

[0013] Fig. 5 is a side elevational view of a tie plate made in accordance with a second embodiment of the present invention;

[0014] Fig. 6 is a side elevational view of a tie plate made in accordance with a third embodiment of the present invention;

[0015] Fig. 7 is a side elevational view of a tie plate made in accordance with a fourth embodiment of the present invention;

[0016] Fig. 8 is a side elevational view of a tie plate assembly made in accordance with the present invention;

[0017] Fig. 8a is an elevational view of a clip of the tie plate assembly shown in Fig. 8;

[0018] Fig. 9 is a perspective view, partially in section, of an electrically-isolated railroad rail system made in accordance with the present invention; and

[0019] Fig. 10 is a top plan view of a tie plate assembly of the electrically-isolated railroad rail system shown in Fig. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The present invention prevents current from passing from one electrically-insulated railroad rail section through a tie plate to another railroad rail section by providing an electrically-insulated tie plate 10 whereby electric current cannot pass through.

[0021] Figs. 1-4 show the tie plate 10 made in accordance with the present invention that includes a base plate 12 having a first surface 14 and a second surface 16 and defining a peripheral edge 17. A pair of longitudinally-extending shoulder members 18, 18' are defined on the first surface 14 of the base plate 12 and can extend a width W of the base plate 12 (shown in Figs. 2 and 4). The second surface 16 of the base plate 12 is generally flat. A recessed area 20 is defined between each shoulder member 18, 18' on the first surface 14 of the base plate 12 and is used to accommodate a railroad rail 56 therebetween (shown in Fig. 8). Also, a plurality of slots 22 having an inner surface 24 are defined on the base plate 12.

The slots 22 are generally adapted to receive fasteners 60 for securing the base plate 12 to a rail tie 86 (shown in Fig. 9). The base plate 12 can be a metallic core made from material such as steel.

[0022] Referring to Figs. 3 and 4, the tie plate 10 further includes a layer 26 of electrically-insulating material encapsulating the entire base plate 12, thus electrically insulating the tie plate 10. The layer 26 of electrically-insulating material can be a polymeric material, such as polyurethane, ultra high molecular weight polyethylene (UHMWPE), or rubber, a polymeric material containing reinforcing fibers, such as glass fibers, or also a laminated fiber glass may be used. The layer 26 can be molded onto the base plate 12 through any conventional method known in the art. The layer 26 for all embodiments disclosed in Figs. 3-7 can also be extruded material such as the polymeric material, the polymeric material containing reinforcing fibers, and the laminated fiber glass as previously discussed, wherein the extruded material is adhered via an epoxy onto the base plate 12. The inner surface 24 of each slot 22 can also be covered by an inner layer 28 made of an electrically-insulating material as shown in Fig. 2. The inner layer 28 and the layer 26 can be made of the same electrically-insulating material. The inner layer 28 may be molded onto the inner surface 24 of each slot 22 or, alternatively, the inner layer 28 can be insertable into each of the slots 22, thus conforming to the shape of the inner surface 24 of the slot 22. The inner layer 28 prevents a fastener 60 from contacting the non-insulated inner surface 24 of the slot 22 in the base plate 12, thereby preventing electric current from passing through the fastener 60 and the base plate 12 to the railroad rail 56 (shown in Fig. 8). This is especially important where two separate railroad rails are attached to the same tie plate as shown in Figs. 9 and 10.

[0023] Fig. 5 shows a second embodiment of a tie plate 30, which is similar to a tie plate 10 except for the below noted difference. Like reference numerals are used for like elements. In tie plate 30, only the first surface 14 of the base plate 12 is covered by a layer 26 of electrically-insulating material instead of the entire base plate 12 as in tie plate 10.

[0024] Fig. 6 shows a third embodiment of a tie plate 34, which is similar to a tie plate 30 except for the below noted difference. Like reference numerals are used for like elements. In tie plate 34, only the recessed area 20 and the shoulder members 18, 18' on the first surface 14 of the base plate 12 are covered by a layer 26 of electrically-insulating material instead of the entire first surface 14 as in tie plate 30. Optionally, the layer 26 may not include lips 19 and 19' depending from legs A and B of the layer 26. Preferably, the layer 26 is made of UHMWPE or laminated fiber glass, but other insulating materials may be used.

[0025] Fig. 7 shows a fourth embodiment of a tie plate 38, which is similar to a tie plate 30 except for the below noted difference. Like reference numerals are used for like elements. Tie plate 38 includes a rectangular-shaped base plate 40 having a planar first surface 42. The layer 26 of electrically-insulating material also covers the first surface 42 and the peripheral edges 17 of the base plate 40. The overall shape of the tie plate 38 is similar to tie plates 10, 30, and 34 except that the pair of longitudinal-extending shoulder members 18, 18' are made of an electrically-insulating material.

[0026] Fig. 8 shows a tie plate assembly 50 for a railroad rail 56 made in accordance with the present invention, wherein like reference numerals are used for like elements. The tie plate assembly 50 includes an electrically-insulated tie plate 52 having a recessed area 54 adapted to receive the railroad rail 56, a plurality of slots 58, 58' defined on the tie plate 52, and at least one fastener 60 passing through one of the slots 58, 58' for securing railroad rail 56 to the tie plate 52. The tie plate 52 can be made of an electrically-insulated material, such as fiberglass. Also, the tie plate 52 can be made similar to tie plates 10, 30, 34, and 38 as previously discussed. Also, it is believed that the tie plate 52 can be extruded.

[0027] Referring to Figs. 8 and 8a, the tie plate assembly 50 also includes at least one electrically-insulated clip 62 defining a hole 64 for receiving the fastener 60. The clip 62 can be secured to the tie plate 52 via the fastener 60, wherein the clip 62 has a surface 66 that can coact with the railroad rail 56 or with a rail joint 76 attached to the railroad rail 56 for securing the railroad rail 56 to the tie plate 52. The surface 66 of the clip 62 defines a first ledge 70 that adapts to coact with the railroad rail 56 for securing the railroad rail 56 to the tie plate 52. A second ledge 72 can also be defined on the surface 66 of the clip 62 and adapted to coact with the rail joint 76 attached to the railroad rail 56 in order to secure further the railroad rail 56 to the tie plate 52. The clip 62 can be made of fiberglass or of the same electrically-insulated material as tie plate 52. The clips 62 may be used in conjunction with the other tie plates disclosed herein and/or other types of insulating tie plates, such as, for example, the POLYPLATE® tie plate manufactured by Portec Rail Products, Inc.

[0028] Figs. 9 and 10 show an electrically-isolated railroad rail system 80 made in accordance with the present invention, wherein like reference numerals are used for like elements. The railroad rail system 80 includes a pair of abutting railroad rails 56, 56' having a gasket 84 therebetween and at least one rail joint 76 attaching the railroad rails 56, 56' together. The gasket 84 is generally made of an electrically-insulated material, such as polyurethane, in order to prevent current from passing between the railroad rails 56, 56'. Typically, one rail joint 76 is attached to one side of the railroad rails 56, 56' and another rail

joint 76' is attached to the opposite side of the railroad rails 56, 56'. The rail joints 76, 76' can be attached to each side of the railroad rails 56, 56' by welding or using mechanical fasteners. The rail joints 76, 76' are generally electrically-insulated in order to prevent current from passing between railroad rails 56, 56' via the rail joints 76, 76'. Such electrically-insulated rail joints 76, 76' are, for example, a Bonded Insulated Rail Joint™ and a POLYJOINT™ rail joint manufactured by Portec Rail Products, Inc.

[0029] With continued reference to Figs. 9 and 10, the railroad rail system 80 also includes an electrically-insulated tie plate 52 having a recessed area 54 (shown in Fig. 8) and defining a plurality of slots 58, 58' as previously discussed. The tie plate 52 can be any of the electrically-insulated tie plates 10, 30, 34, and 38 as previously discussed. The attached railroad rails 56, 56' are received within the recessed area 54 of the tie plate 52. A fastener 60 passing through one of the slots 58 can be used to secure the tie plate 52 to a rail tie 86. The railroad rail system 80 can include a plurality of electrically-insulated clips 62, each defining a hole 64 as previously discussed. The clips 62, which have a surface 66 defining a first ledge 70 and a second ledge 72 (shown in Fig. 8a), can coact with railroad rails 56, 56' and the respective rail joint 76 or 76'. Referring to Figs. 8 and 9, the first ledge 70 of the clip 62 abuts against a bottom surface of the railroad rail 56 or 56', and the second ledge 72 abuts against a bottom surface of the respective rail joint 76 or 76', wherein the fastener 60 passing through the hole 64 in the clip 62 and one of the slots 58' adjacent the railroad rails 56, 56' can be used to secure both the railroad rails 56, 56' to the tie plate 52 and the tie plate 52 to the rail tie 86.

[0030] In operation, an electrically-insulated tie plate 52 is placed on a rail tie 86. Next, a pair of abutting railroad rails 56, 56' having a gasket 84 therebetween are joined together via a pair of rail joints 76, 76', each attached to one side of the pair of abutting railroad rails 56, 56'. Third, the attached railroad rails 56, 56' are then received within a recessed area 54 of an electrically-insulated tie plate 52. Fourth, a hole 64 defined in an electrically-insulated clip 62 is aligned with a slot 58' adjacent the railroad rails 56, 56' in the tie plate 52 so that a surface 66 of the clip 62 contacts both the railroad rail 56 or 56' and the rail joint 76 or 76', respectively. Fifth, a fastener 60 is inserted through the hole 64 in the clip 62 and the slot 58' adjacent the railroad rails 56, 56' in the tie plate 52, wherein the surface 66 of the clip 62 coacts with the railroad rail 56 or 56' and the rail joint 76 or 76', respectively, thus securing the railroad rails 56, 56' to the tie plate 52 and the tie plate 52 to the rail tie 86. Finally, fasteners 60 are inserted through slots 58 in the tie plate 52, thus securing the tie plate 52 to the rail tie 86.

[0031] This invention has been described with reference to the preferred embodiments. Obvious modifications and alterations will occur to others upon reading and understanding the preceding detailed description. It is intended that the invention be construed as including all such modifications and alterations.